

1 relates to Fig. 8. The mirror is depicted as element 802 in the exemplary system
2 shown in Fig. 8.

3
4 **Objection to Claim 31.**

5 4. Claim 31 has been amended to replace "fiducial" with "fiduciary". The
6 specification at page 14 line 4 has been similarly amended.

7
8 **6. Rejection of claims under 35 USC §102**

9 Claims 1-17 and 27-43 have been rejected under 35 USC §102(b) as being
10 anticipated by Nguyen (Patent No. US 5,389,789). Applicant respectfully traverses
11 this rejection of the claims. Nguyen describes a system in which a light sensor is
12 used to detect whether a moving object has blocked the sensor. This provides
13 information as to the *time* when the edge of the object passes the sensor. To
14 determine the position of the edge of the object, Nguyen must use an array of
15 sensors. If one sensor is obscured and the adjacent one is not, the edge is
16 determined to be somewhere between the two sensors. A system of this type has a
17 spatial resolution determined by the physical size of the sensors and the spacing of
18 the sensors. In Nguyen's system this is on the order of 1/16". In contrast, the
19 present invention measures the positioning of an edge to a sub-micron accuracy --
20 more than 1000 times better resolution. Additionally, this uses a *single* optical
21 transmitter and receiver. This improved resolution is obtained by (1) using laser light
22 -- which has a very narrow beam -- and (2) by positioning the edge within the light
23 beam so that it partially obscures the sensor. The amount of light that is blocked is
24 used to determine how much of the sensor is blocked and therefore the position of
25 the edge. The resolution is a fraction of the diameter of the optical fiber sensor.
26 Resolution is further enhanced by using optical fibers having very small diameters.

1 Applicant submits that (1) and (2) are not taught by Nguyen, neither is the use of a
2 single sensor for edge detection.

3
4 **Claim 1** has been rejected under 35 USC §102 as being anticipated by Nguyen (US
5 5,389,789). Applicant respectfully traverses this rejection. Nguyen discloses a
6 device for measuring gaps or tears in paper in a paper machine and also for
7 detecting the edges of the paper. The device differs from the device claimed in
8 claim 1 in several respects.

9 Firstly, Nguyen does not teach the use of a laser light source and the optical
10 fibers in Nguyen's device are not adapted to receive laser light. The examiner relies
11 upon col. 4, lines 6-8 which described the use of IR (infra red) light in a specified
12 band of wavelengths rather than laser light. Sensors of the type supplied by
13 Scientific Technologies (col. 4, lines 41-47) use light emitting diodes (LEDs) as the
14 light source. LEDs produce light in a narrow band, but this light is neither
15 monochromatic nor coherent, so is not equivalent to laser light. Laser light produces
16 a much narrower beam, which provides greater resolution.

17 Secondly, in claim 1 an edge is detected when the object partially obstructs
18 the light beam. Nguyen detects the edge only when complete obstruction of the light
19 beam has occurred, i.e. when the source is blocked (col. 3 lines 18-26). The use of
20 partial obstruction, together with fibers adapted for use with laser light, allows much
21 greater accuracy to be achieved. Nguyen's detector has a resolution of about 0.125"
22 (3175 μ m) (col. 5, lines 44-49), whereas the detector of the present invention has a
23 resolution of less than 1 μ m. The examiner relies upon col. 4 lines 1-6, which merely
24 says that the light source (12) and receiver (14) are positioned one each side of the
25 web (16) -- the method of detection of the edge 26 is not described.

1 Thirdly, the invention claimed in Claim 1 is further distinguished from Nguyen
2 in that single light-detector is used. Nguyen requires multiple light detectors to
3 detect an edge (col. 3, lines 189-26).

4 Claim 1 has been amended the explicitly call out these features that are
5 implicit in the claim as originally submitted and to enhance the clarity of the claim.

6
7 **Claim 2** has been rejected under 35 USC §102 as being anticipated by Nguyen.
8 Applicant respectfully traverses this rejection. Nguyen discloses a light source (12)
9 but does not teach, suggest, disclose or render obvious that this is a laser light
10 source. The light is described as having wavelengths in the range 7.5-9 μm (col. 4
11 lines 8-10). This is consistent with the only example given by Nguyen (col. 4, lines
12 41-47) which uses an LED light source. Laser light is fundamentally different from
13 most other forms of light (including that generated by an LED) because it is coherent
14 and monochromatic.

15
16 **Claim 3** has been rejected under 35 USC §102 as being anticipated by Nguyen.
17 Applicant respectfully traverses this rejection. Nguyen's Fig. 1 does not show a
18 mirror. Applicant submits that Nguyen does not teach, suggest, disclose or render
19 obvious the use of a mirror and does not teach the use of reflected light.

20
21 **Claim 4** has been rejected under 35 USC §102 as being anticipated by Nguyen.
22 Applicant respectfully traverses this rejection. Nguyen's Fig. 2 shows large diameter
23 (up to 1/16") optical fibers 34. For a fiber to operate as a single mode fiber for light
24 of a given wavelength, the diameter of the fiber must be of the same order or smaller
25 than the wavelength of the light. Nguyen uses fibers of diameter up to 1/16" or 1587
26 μm (col. 4, lines 16-21) together with light with wavelengths in the range 7.5-9 μm
27 (col. 4 lines 8-10). These fibers cannot act as single mode fibers. Furthermore,

1 Nguyen does not teach, suggest, disclose or render obvious the use of single mode
2 optical fibers.

3
4 **Claim 5** has been rejected under 35 USC §102 as being anticipated by Nguyen.
5 Applicant respectfully traverses this rejection. Nguyen (col. 4, line 8) teaches that
6 the wavelength of the light in the range 7.5-9 μm . This dimension relates to the
7 scale of variations in the light beam along the length of the beam, and is unrelated to
8 the diameter of the light beam. In Nguyen's device the light beam will have an initial
9 diameter corresponding to the diameter of the fiber, which can be up to 1/16" or
10 1587 μm (col. 4, lines 16-21). Furthermore, the light beam will spread with distance.
11 The applicant submits that this teaches away from the use of a light beam with a
12 diameter more than 1000 times smaller.

13
14 **Claim 6** has been rejected under 35 USC §102 as being anticipated by Nguyen.
15 Applicant respectfully traverses this rejection. No fibers or retainer are shown in
16 Nguyen's Fig. 1. However, in Fig. 2 the optical fibers 34 are shown attached, at one
17 end, to the receivers (32) and the transmitters (30). The other ends of the fibers are
18 not retained and the fibers are not retained along their length. Motion of these fibers
19 would limit the accuracy of edge detection. However, since Nguyen uses large
20 diameter optical fibers (diameter up to 1/16") the fibers may be self-supporting. The
21 thin fibers used in the present invention are retained at the ends where the light
22 beam is transmitted and received, as shown in Figs. 1, 4 and 6. Claim 6 has been
23 amended to clarify which parts of the first and second fibers are retained.

24
25 **Claim 7** has been rejected under 35 USC §102 as being anticipated by Nguyen.
26 Applicant respectfully traverses this rejection. No retainers comprising a frame and
27 block are shown in Nguyen's Fig. 1. Claim 7 depends from claim 6, which has been
28 amended as described above.

1 **Claim 8** has been rejected under 35 USC §102 as being anticipated by Nguyen.
2 Applicant respectfully traverses this rejection. Firstly, Nguyen discloses a light
3 source (12) but does not teach, suggest, disclose or render obvious that this is a
4 laser light source. Laser light is fundamentally different from most other forms of
5 light because it is coherent and monochromatic. Secondly, Nguyen does not teach,
6 suggest, disclose or render obvious the use of a positioning stage. Nguyen's web
7 (16) runs in direction A at a constant speed (col. 4, lines 1-3 and col. 5, lines 1-4). A
8 positioning stage, as known in the art, does not move at a constant speed, has a
9 finite range of motion and is designed to move an object to a position and hold it
10 stationary in that position. This is not equivalent to a papermaking machine. Thirdly,
11 Nguyen does not disclose the use of "a controller operably coupled to a positioning
12 stage and responsive to the optical power signal, the controller being configured to
13 cause the positioning stage to position the object a predetermined position...". In
14 Nguyen's Fig. 1, the signal processor (20) is coupled to the light sensor (14), a
15 memory (22) and a display device (24). It is not coupled to, nor does it have control
16 over, a positioning stage. Applicant submits that the positioning of a moving edge of
17 an object is not equivalent to positioning the object itself at a predetermined location.
18 In the former case the object is free to move in at least one direction (the direction A
19 in Nguyen's system), in the latter case the position of the object is fixed. The
20 examiner relies upon col. 3, lines 18-26, which only describes the monitoring of an
21 edge, not control of its position. Claim 8 has been amended to emphasize that the
22 edge of the object is within the light beam.

23
24 **Claim 9** has been rejected under 35 USC §102 as being anticipated by Nguyen.
25 Applicant respectfully traverses this rejection. Nguyen's system is primarily a
26 monitoring system rather than a control system. The detected gaps are logged in
27 memory or displayed on a display device but no subsequent action to "cause the
28 positioning stage to position the object at a predetermined position" is described.

1 **Claim 10** has been rejected under 35 USC §102 as being anticipated by Nguyen.
2 Applicant respectfully traverses this rejection. Claim 10 depends from claim 8, which
3 is discussed above.

4
5 **Claim 11** has been rejected under 35 USC §102 as being anticipated by Nguyen.
6 Applicant respectfully traverses this rejection. Nguyen uses a number of counters to
7 measure the time between successive edges (col. 7 line 66 to col. 8 line 1). This
8 time is proportional to the width of the gap, and since the web is moving at a
9 constant speed, the time is proportional to the width of the gap. A gap is detected if
10 the *time* (counter value) is within some range. The width of the gap cannot be
11 adjusted to produce a counter value in this range. In contrast, in the present
12 invention the edge of an object is positioned between two optical fibers such that the
13 *optical power* is within a specified range. The examiner relies upon col. 8, lines 12-
14 19, where an edge position is determined according to the order in which the
15 channels are activated (the present invention does not require multiple channel) and
16 the value of counters (the present invention does not use counters).

17
18 **Claim 12** has been rejected under 35 USC §102 as being anticipated by Nguyen.
19 Applicant respectfully traverses this rejection. Nguyen uses a number of counters to
20 measure the time between successive edges (col. 7 line 66 to col. 8 line 1). This
21 time is proportional to the width of the gap, and since the web is moving at a
22 constant speed, the time is proportional to the width of the gap. A gap is detected if
23 the *time* (counter value) is within some range. The thresholds that determine this
24 range depend upon the expected width of a gap and the speed of the web. In
25 contrast to the present invention, the thresholds do not depend upon the maximum
26 sensor power. The examiner relies upon col. 5, lines 45-49, which discusses a
27 relationship between the number of channels triggered and the width of a gap. The
28 present invention does not require the use of multiple channels.

1 **Claim 13** has been rejected under 35 USC §102 as being anticipated by Nguyen.
2 Applicant respectfully traverses this rejection. The examiner relies on col. 4, lines
3 60-64, which does indicate which feature of the response is being calibrated. The
4 applicant believes that Nguyen uses a calibration to determine the relationship
5 between the time response of the sensor and the width of a gap (col. 5 lines 15-21).
6 This calibration is used because the time response of sensors varies. No calibration
7 of the amplitude response is disclosed.

8
9 **Claim 14** has been rejected under 35 USC §102 as being anticipated by Nguyen.
10 Applicant respectfully traverses this rejection. Nguyen measures the width C-D at
11 regular intervals (i.e. once per revolution) *during calibration* only. In the present
12 invention, the maximum power is re-measured *during operation*. Claim 14 has been
13 amended to better clarify this distinction. The examiner relies upon col. 5, lines 34-
14 37, which describes the use of counter to measure a time interval. No amplitude
15 measurement is taught, suggested or otherwise rendered obvious.

16
17 **Claim 15** has been rejected under 35 USC §102 as being anticipated by Nguyen.
18 Applicant respectfully traverses this rejection. Claim 15 depends from claim 11
19 discussed above. Referring to Nguyen col. 5 lines 50-56, the present invention
20 detects position rather than crack width and does not require the use of multiple
21 sensor channels.

22
23 **Claim 16** has been rejected under 35 USC §102 as being anticipated by Nguyen.
24 Applicant respectfully traverses this rejection. Applicant submits that Nguyen does
25 not teach the use of a positioning stage. Nguyen's web (16) runs in direction A at a
26 *constant speed* (col. 4, lines 1-3 and col. 5, lines 1-4). A positioning stage, as known
27 in the art, does not move a constant speed, has a finite range of motion and is
28 designed to move an object to a position and hold it *stationary* in that position. This
29 function is not performed by a papermaking machine, which produces continuous

1 motion. The examiner relies upon col. 1, lines 13-18, which does not suggest,
2 disclose or render obvious the use of a positioning stage.

3
4 **Claim 17** has been rejected under 35 USC §102 as being anticipated by Nguyen.
5 Applicant respectfully traverses this rejection. As discussed above with reference to
6 claim 16, applicant submits that Nguyen does not teach the use of a positioning
7 stage. The examiner relies upon col. 1, lines 19-23, which does not suggest,
8 disclose or render obvious the use of a positioning stage or a retainer.

9
10 **Claim 27** has been rejected under 35 USC §102 as being anticipated by Nguyen.
11 Applicant respectfully traverses this rejection. As discussed above with reference to
12 claim 16, applicant submits that Nguyen does not teach the use of an object
13 positioning stage. Further, applicant submits that Nguyen does not teach the use of
14 a detector positioning stage. The examiner relies upon col. 6, lines 3-15, which
15 describes the use of a fixed detector to detect an edge. No mechanism equivalent to
16 a detector positioning stage is described, suggested or otherwise rendered obvious.
17 As discussed above with reference to claim 1, Nguyen does not teach the use of
18 optical fibers adapted to receive laser light. Claim 27 has been amended to correct
19 a typographical error.

20
21 **Claim 28** has been rejected under 35 USC §102 as being anticipated by Nguyen.
22 Applicant respectfully traverses this rejection. As discussed above with reference to
23 claim 8, applicant submits that Nguyen does not use a controller to position an
24 object at a predetermined position since the object (the web) is in constant motion.
25 Claim 28 has been amended to better clarify this distinction. The examiner relies
26 upon col. 5, lines 4-11. This describes the detection of the *times* during which a slot
27 in disc allows light to reach the detector. These times are measured and used to
28 calibrate the time-response of the detection system. The position of slot is not

1 controlled in response to the optical power. The position of the slot if not even
2 defined since it is in constant motion.

3
4 **Claim 29** has been rejected under 35 USC §102 as being anticipated by Nguyen.
5 Applicant respectfully traverses this rejection. Claim 29 depends from claim 27,
6 which is discussed above.

7
8 **Claim 30** has been rejected under 35 USC §102 as being anticipated by Nguyen.
9 Applicant respectfully traverses this rejection. Claim 30 depends from claim 27,
10 which is discussed above.

11
12 **Claim 31** has been rejected under 35 USC §102 as being anticipated by Nguyen.
13 Applicant respectfully traverses this rejection. Nguyen uses a spinning disc for
14 calibration (col. 4, lines 60-64). The positions of the slot edges in this disc are not
15 known as it spins. In contrast, the fiduciary in the present invention is at a known
16 position relative to the detector. Claim 31 has been amended in response to the
17 examiner's objection.

18
19 **Claim 32** has been rejected under 35 USC §102 as being anticipated by Nguyen.
20 Applicant respectfully traverses this rejection. Claim 32 depends from claim 27,
21 which is discussed above.

22
23 **Claim 33** has been rejected under 35 USC §102 as being anticipated by Nguyen.
24 Applicant respectfully traverses this rejection. While the use of *linear* servomotors in
25 positioning stages is known, it is common practice for a papermaking machine, such
26 as that described by Nguyen, to use the *rotation* of rollers to move the web and the
27 paper.
28

1 **Claim 34** has been rejected under 35 USC §102 as being anticipated by Nguyen.
2 Applicant respectfully traverses this rejection. Claim 34 calls for "passing light from
3 a laser source through a first optical fiber". Nguyen does not teach that the light
4 source (12) is a *laser* light source. Further, claim 34 calls for "positioning the edge of
5 the object *within* the light beam such that the optical power of the received light is
6 greater than a lower threshold and less than an upper threshold" (emphasis added).
7 Nguyen teaches the use of multiple sensor channels and determines the edge
8 position by the number of sensors that are completely obscured. Hence a moving
9 edge is positioned between adjacent light beams. Claim 34 has been amended to
10 correct a typographical error and to emphasize that the object only partially obscures
11 the second optical fiber. The scope of the claim is substantially unchanged, with
12 implicit meaning now made explicit.

13
14 **Claim 35** has been rejected under 35 USC §102 as being anticipated by Nguyen.
15 Applicant respectfully traverses this rejection. Nguyen uses a number of counters to
16 measure the time between successive edges (col. 7 line 66 to col. 8 line 1). This
17 time is proportional to the width of the gap, and since the web is moving at a
18 constant speed, the time is proportional to the width of the gap. A gap is detected if
19 the *time* (counter value) is within some range. The thresholds that determine this
20 range depend upon the expected width of a gap and the speed of the web. In
21 contrast to the present invention, the thresholds do not depend upon the maximum
22 sensor power.

23
24 **Claim 36** has been rejected under 35 USC §102 as being anticipated by Nguyen.
25 Applicant respectfully traverses this rejection. Nguyen uses a calibration to
26 determine the relationship between the time response of the sensor and the width of
27 a gap (col. 4, lines 60-64 and col. 5 lines 15-21). This calibration is used because
28 the time response of sensors varies. No calibration of the amplitude response is
29 disclosed.

1
2 **Claim 37** has been rejected under 35 USC §102 as being anticipated by Nguyen.
3 Applicant respectfully traverses this rejection. Nguyen measures the width C-D at
4 regular intervals (i.e. once per revolution) *during calibration* only. In the present
5 invention, the maximum power is re-measured *during operation*. Claim 37 has been
6 amended to better clarify this distinction.

7
8 **Claim 38** has been rejected under 35 USC §102 as being anticipated by Nguyen.
9 Applicant respectfully traverses this rejection. Claim 38 depends from claim 34,
10 which is discussed above.

11
12 **Claim 39** has been rejected under 35 USC §102 as being anticipated by Nguyen.
13 Applicant respectfully traverses this rejection. Claim 39 depends from claim 34,
14 which is discussed above.

15
16 **Claim 40** has been rejected under 35 USC §102 as being anticipated by Nguyen.
17 Applicant respectfully traverses this rejection. The examiner relies upon col. 1, lines
18 19-23, in which Nguyen discusses the need to keep the web in motion. This
19 motivates the use of an optical tear detector. However, there is no description of
20 positioning an object or moving a retainer for an optical fiber. In addition, col. 2,
21 lines 44-48 indicates that the detector does not track lateral drifts in the web,
22 implying that the detector and any retainer is stationary.

23
24 **Claim 41** has been rejected under 35 USC §102 as being anticipated by Nguyen.
25 Applicant respectfully traverses this rejection. Claim 41 depends from claim 34,
26 which is discussed above.

27
28 **Claim 42** has been rejected under 35 USC §102 as being anticipated by Nguyen.
29 Applicant respectfully traverses this rejection. The examiner relies upon col. 4, lines

1 32-38 in which Nguyen describes how the number of sensors required is determined
2 by the size of the crack to be measured. The present invention only requires a
3 single sensor and is used to position an edge with the light beam rather than to
4 measure a gap. The web in Nguyen's system is moved at a constant speed, rather
5 than in a series of steps "proportional to the difference between the optical power
6 and the target optical power".
7

8 **Claim 43** has been rejected under 35 USC §102 as being anticipated by Nguyen.
9 Applicant respectfully traverses this rejection. As described above, Nguyen in col. 4,
10 lines 32-38 describes how the number of sensors required is determined by the size
11 of the crack to be measured. The present invention only requires a single sensor
12 and is used to position an edge with the light beam rather than to measure a gap.
13 The web in Nguyen's system is moved at a constant speed, rather than repeatedly
14 moving the object by "a predetermined distance until the optical power is greater
15 than the lower threshold and less than the upper threshold".
16

17 **Claim 44.** New claim 44 has been added which depends from independent method
18 claim 34. The Examiner has indicated that claim 34 relates to species 1 (Fig. 1).
19 Claim 44 relates to Species II (Fig. 8). Therefore, applicant submits that claim 34 is
20 generic to both species I and species II.
21

22 In light of the foregoing amendments and explanations, applicant submits that all
23 rejections of claims 1-17 and 27-43 and the restriction requirements have been
24 overcome. The scope of the amended claims is substantially the same with implicit
25 meaning now made explicit. Allowance of claims 1-17 and 27-44 and withdrawal of
26 the restriction requirement for claims 18-26 are therefore respectfully requested at the
27 Examiner's earliest convenience. Although additional arguments could be made for

1 the patentability of each of the claims, such arguments are believed unnecessary in
2 view of the above discussion. The undersigned wishes to make it clear that not
3 making such arguments at this time should not be construed as a concession or
4 admission to any statement in the Office Action.

5
6 Please contact the undersigned if you have any questions regarding this response or
7 application.

8
9 Respectfully submitted,

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